

Department of Energy Office of High Energy Physics

Committee of Visitors Report

June 2007

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Executive Summary

The Committee of Visitors (COV) for the Office of High Energy Physics (OHEP) was formed as a subcommittee of the High Energy Physics Advisory Panel (HEPAP). It met for two days on June 18-19, 2007. The meeting began with presentations by the associate director and senior staff for OHEP and covered the organization of the office, as well as reports on the major activities in the program: accelerators, national laboratories, universities and projects. The COV then divided into four subgroups for interactive sessions with the responsible OHEP program officers in each sub-area. The groups read a selected sample of folders, in order to validate the process and funding actions. This review covered actions in OHEP for the period of FY2004-2006. In addition to the reviews of research proposal actions, the COV looked at the large HEP investments in the national laboratories, the accelerators and the major detector facilities. The methods used by OHEP for monitoring, reviewing and prioritizing these programs were evaluated.

The first conclusion of this COV review was to validate the integrity and efficacy of the processes for treating proposals and for making funding actions, and to validate the OHEP program management of the national laboratories and large facilities.

An important observation of the COV is how much the overall success of OHEP relies on the dedication and skills of the staff to carry out their mission.

The COV would like to thank Dr. Robin Staffin for giving us such a broad charge for this review and the encouragement to think deeply about how to improve the office. We hope that our observations and suggestions will be helpful. As importantly, we want to thank the highly professional staff of OHEP for supporting all our attempts to understand and

evaluate the functions and processes of the office. The preparations and responsiveness to our questions and requests were impressive and were essential in enabling us to learn enough about this complex office to carry out our charge in two days.

We hope our report will lead to an even stronger OHEP and we believe that such improvements will in turn reflect themselves in a stronger and more robust HEP research program.

Below we highlight several overall recommendations, and we make other suggestions throughout the body of the report.

Recommendations

The COV found the overall functioning of the OHEP office to be very professional and we are impressed with the responsible and excellent job that is done in soliciting and evaluating proposals, making grants and monitoring the funded programs. However, the COV did find some areas of concern. In this report we make a variety of observations, recommendations and suggestions where we believe that the functioning of the office could be improved. And, we believe that improvements in the office will lead to improvements in the quality of the research program that is carried out in high energy physics.

In this report, we make eighteen recommendations for ways in which the functioning of the office and program could be further improved. These recommendations are listed below. The reasoning behind them is explained in the body of the report.

Recommendation 1

We strongly recommend that an urgent effort be directed to filling all the vacant staff positions in the office, and indeed to consider adding additional IPA positions. Positions in OHEP are challenging, highly rewarding, and carry a great deal of influence in the field and the office should work to educate members of our community as to the interesting and exciting nature of these positions in order to attract the highest level of applicants.

We make the following concrete suggestions to help in this process:

- **Mobilize the help of the community in the search process – for example, by setting up a “search committee” of community members to identify and recruit potential candidates, or by mobilizing the laboratory user groups.**
- **Take steps to raise the profile and awareness of OHEP staff’s role and how interesting and important these positions can be. Existing staff could be profiled and used as role models.**
- **The office should be open to using IPA posts wherever appropriate and be proactive about their recruitment**

- **The office should try to help applicants through any additional hurdles created by the hiring process**

Recommendation 2

- **We recommend that documentation and access to program data continues to be improved and that data is put into electronic form where this is not yet the case (the university grants program being one example).**

Recommendation 3

We recommend that

- **The office should continue to work with P5 and HEPAP in evolving the medium term program.**
- **Ensure that the program planning function within the office is adequately staffed and supported given its importance.**
- **Ensure continuing effective and ongoing engagement with all other potential stakeholders in the ILC, both in the US government and abroad**

Recommendation 4

- **We recommend that OHEP decisions and the rationale behind them should be effectively communicated to the community**

Recommendation 5

- **We recommend that the office develop a process to globally optimize and comparatively review the balance of support for HEP research at Fermilab, the universities and the other laboratories in light of the evolving program.**

Recommendation 6

- **We recommend that the office understand and communicate appropriate best practices for reviews, as suggested in this report, and ensure they are followed.**
- **The office should consider whether the consultancy model is optimal.**

Recommendation 7

- **The number of Outstanding Junior Investigator awards should be increased by devoting more funds to this program.**

Recommendation 8

- **New and renewal proposals should be limited to a maximum of 10 pages per senior investigator. Proposals not meeting page-length limits or lacking required information should be returned for revision before being sent out for review.**

Recommendation 9

- **Outside visiting consultants should continue to be used for 3-year renewals of large grants. The office should consider eliminating site visits in continuation years unless some unusual circumstance warrants such a visit.**

Recommendation 10

- **OHEP should consider providing a template to reviewers to provide guidance and greater uniformity of reviews.**
- **The office should ensure there are sufficient reviewers for the theory component of multi-task grants.**

Recommendation 11

- **Each proposal jacket should contain as the first page a brief summary sheet which shows a history of funding levels by task, current funding, and personnel supported by category. As the proposals are moved online, this summary sheet should also be online.**

Recommendation 12

- **The Office should establish a formal advisory mechanism to best optimize the split between ILC accelerator and ILC detector R&D funds.**

Recommendation 13

- **OHEP should work with the community and the laboratories to formulate a plan for stewardship of accelerator science in the US during the coming transition to a period without an energy frontier machine. This plan should recognize the centrality of maintaining and developing high energy accelerator science and technology in the US, and training the next generation. This goal can be accomplished through US-centered mid- and long-term research, through collaborative activities overseas and through participation in other Office of Science projects.**

Recommendation 14

- **The peer-review process in accelerator research should be expanded to cover mid-term accelerator research to provide comparative evaluation of the merit of different research efforts.**

Recommendation 15

- **The project initiation and management process in the OHEP should continue to be closely aligned with the HEPAP/P5 prioritization process for HEP and the strategic goals of the Office of Science. Interactions with the appropriate advisory bodies should increase in frequency. The detailed budget and schedule planning for major projects needs to be more proactive, particularly at this critical juncture for high energy physics.**

Recommendation 16

- **To the greatest extent possible, only those major projects for which the physics goals are well matched to the priorities in the field, and whose overall scope, cost estimate and funding requirements are consistent with each other should be advanced to construction status. In this regard, establishing a funding cap prior to establishing a realistic baseline should be avoided because it introduces risk that a project can not be completed within budget or that its scientific scope will not be delivered.**

Recommendation 17

- **The office should continue to pursue opportunities to support projects in collaboration with other agencies, both domestic and international. The Office should recruit an individual (or an IPA position) to be proactive in coordinating and facilitating these efforts, including international agreements, at a high level within the OHEP.**

Recommendation 18

- **The office should add staff to the Facilities Division to provide sufficient project management oversight for upcoming major projects.**

Introduction

The Committee of Visitors (COV) for the Office of High Energy Physics (OHEP) for fiscal year (FY) 2007 held a review at the Department of Energy (DOE) in Germantown, Maryland, on June 18-19, 2007. The COV is an *ad hoc* subcommittee formed in response to a request to the High Energy Physics Advisory Panel (HEPAP) to assess its program management, to provide advice to improve OHEP performance, and to ensure openness to the research and education community served by the DOE for the periods FY04, FY05 and FY06.

In particular, the COV was asked to report on:

- The integrity and efficacy of processes used to solicit, review, recommend, and document proposal actions;
- The integrity and efficacy of processes used to review, recommend, authorize, and document funding actions under the Management and Operations contracts in place at the DOE national laboratories
- The overall quality and significance of the results of the Office's program-wide investments;
- The relationship between award decisions, program goals, and Office of Science-wide programs and strategic goals;
- The Office's research investment, balance, and priorities;
- The organization, effectiveness, and adaptability of the OHEP operation to the evolving research environment.
- Any other issues that the COV feels are relevant to the review.

The membership of the COV committee is given in Appendix A, the agenda for the review meeting is given in Appendix B and the complete charge to the committee is given in Appendix C.

The committee was organized into subgroups reviewing four areas that cover the major activities in the HEP program: national laboratories, universities, accelerators and projects. Each group reviewed the funding actions in their area of concentration handled by the Office during the years 2004, 2005 and 2006. The efficacy of the OHEP processes was reviewed, as well as how the actions reflect the priorities, investments and balance in the field.

Prior to the meeting, a website was created that contained much useful materials for the COV, including presentations, statistical information and details of the previous (2004) COV visit.

The COV subgroups selected sample folders representative of the program, as well as other pertinent information. Several parallel sessions were dedicated to reviewing these materials. In addition, overview presentations were made to the entire committee at the beginning of the meeting and each group carried out detailed question and answer

sessions with DOE program managers in their sub-area. Finally, the committee met in executive session to formulate its findings, which were presented to the Associate Director and the OHEP staff in a “close-out” session.

This report represents the final report of our committee.

Context: High Energy Physics in 2007

Though the COV was naturally focused on issues of process and procedure for much of its visit, the context was set by the state of high energy physics in 2007. These are clearly both exciting and challenging times for the field. Exciting, because with the imminent startup of operations of the Large Hadron Collider at CERN, we stand on the brink of definitive answers to questions we have grappled with for so long: what physics governs the TeV scale at which our standard model of particles and forces falls apart? Is it merely a Higgs boson – but if so, what are its properties? Are there new symmetries of space and time, like supersymmetry, which bring with them large numbers of new particles? Are there instead new forces, like Technicolor, at work? At the same time, experiments to follow up the past decade’s discoveries in other areas – the fact that neutrinos have mass and mix with each other, the realization that the bulk of matter in the universe is not in the form of quarks and leptons but is some kind of weakly interacting dark matter, and, most puzzling of all, the apparent existence of dark energy as a dominant component of the cosmos, point to a broad and vibrant program of discovery physics across the range of the Office of High Energy Physics’ activities.

The challenges stem from the imminent major transitions in the US program. In the next two years, the domestic accelerator-based experiments which have formed the backbone of the US HEP program for the past decade – BaBar at SLAC, and CDF and DØ at Fermilab – will cease operations. New opportunities at LHC, together with a number of smaller projects and R&D for the future International Linear Collider, will take their place. This transition is science driven and follows the priorities expressed by the field through the advisory process, but it affects a large fraction of the Office’s investment and therefore requires careful management.

We noted that since the previous Committee of Visitors there have been significant developments in the advisory process. The High Energy Physics Advisory Panel (HEPAP) has been increased in size from about 16 to 25, in order to better represent a broadening field (including particle astrophysics, for example). It now has, as a matter of policy, at least two members from the European and Asian regions of the world, to help inform HEPAP and the US Government on activities and planning from the other regions. DOE and NSF have established and strengthened the Particle Physics Projects Prioritization Panel (P5) as a subpanel of HEPAP in a form closer to what was originally recommended: its charge is to develop a science and facilities roadmap which is required to fit under a realistic five-year budget plan (based on the Administration’s submissions to Congress). A Scientific Assessment Group (SAG) process has been created to inform P5 and HEPAP on scientific opportunities and potential within a particular sub-field; for

example NuSAG on neutrino physics (jointly with NSF and DOE Nuclear Physics) and DMSAG on dark matter. In addition, a Dark Energy Task Force was established together with AAAC. HEPAP subpanels were charged to study accelerator R&D, and the University Grants Program. Two reports on the theme of the Quantum Universe were commissioned from ad-hoc panels, and the influential National Academies panel on elementary particle physics (EPP2010) was carried out.

The Quality and significance of the results of OHEP's programmatic investments is high: the B factory and the Tevatron program have been highly successful flagship projects. Since 2000, these two research programs have produced over 500 papers in Physical Review and Physical Review Letters. A productive neutrino physics program has been carried out at MiniBooNE and MINOS, and US involvement in the LHC has been substantial and successful. OHEP support also led to the discovery of dark energy, which is arguably one of the most dramatic scientific discoveries in recent times.

Office and Program-wide Issues

The committee met in plenary session to discuss the overall performance of the office and to identify issues that cut across all of its programs.

Organization and effectiveness of the operation

The first and most serious issue mentioned in the 2004 COV report was that OHEP was very seriously understaffed, both due to unfilled positions, and also because of a need for new positions to carry out new functions. We note that some of the previous openings have now been filled, but other vacancies have since occurred. Overall, the staffing deficit is if anything worse now than in 2004. We agree with the AD that the current situation is unsustainable. The office staff is dedicated but hugely overloaded and in many cases the AD lacks high level staff to whom he can delegate responsibilities.

The committee was also concerned to hear that the situation is apparently exacerbated by a cumbersome hiring process which limits the information available on applicants even months after the opening has been posted and restricts the ability of the managers to influence the selection of the candidate. We understand that this is a broad problem whose impact is not limited to OHEP or even DOE.

Recommendation 1

We strongly recommend that an urgent effort be directed to filling all the vacant staff positions in the office, and indeed to consider adding additional IPA positions. Positions in OHEP are challenging, highly rewarding, and carry a great deal of influence in the field and the office should work to educate members of our community as to the interesting and exciting nature of these positions in order to attract the highest level of applicants.

We make the following concrete suggestions to help in this process:

- **Mobilize the help of the community in the search process – for example, by setting up a “search committee” of community members to identify and recruit potential candidates, or by mobilizing the laboratory user groups.**
- **Take steps to raise the profile and awareness of OHEP staff’s role and how interesting and important these positions can be. Existing staff could be profiled and used as role models.**
- **The office should be open to using IPA posts wherever appropriate and be proactive about their recruitment**
- **The office should try to help applicants through any additional hurdles created by the hiring process**

We note that the quality of office documentation and access to data about the program has improved in a number of areas since the previous COV review, but that there remain areas that could be improved.

Recommendation 2

- **We recommend that documentation and access to program data continues to be improved and that data is put into electronic form where this is not yet the case (the university grants program being one example).**

Research investment balance and priorities

The planned program balance correctly reflects the priorities expressed by the field through HEPAP, P5 and the EPP2010 advisory panels. However, the resulting mix of projects (LHC, ILC, and a portfolio of smaller projects) makes program management both challenging and important. The current desire to maintain focus on the ILC as the major long term goal for US HEP while at the same time providing additional medium term discovery opportunities will be a challenge; P5 and HEPAP should be fully engaged in this process.

The scale and international nature of the ILC also mean that its success depends on the commitment of other stakeholders (in the US government and abroad) to a much larger extent than has been the case for other projects. OHEP should continue to engage proactively with these stakeholders and ensure that their positions and concerns are understood.

Recommendation 3**We recommend that**

- **The office should continue to work with P5 and HEPAP in evolving the medium term program.**
- **Ensure that the program planning function within the office is adequately staffed and supported given its importance.**
- **Ensure continuing effective and ongoing engagement with all other potential stakeholders in the ILC, both in the US government and abroad**

We note that in the past few years, the community has not always understood the methodology or reasoning behind some major program decisions and how they were made in OHEP. This lack of understanding can and sometimes has led to dissatisfaction in the past. Good communication is critical to ensure confidence in the decision making process.

Recommendation 4

- **We recommend that OHEP decisions and the rationale behind them should be effectively communicated to the community**

It is not obvious how the balance between university and lab programs is appropriately optimized. With the missions of all the laboratories (except Fermilab) now evolving away from HEP accelerator operations, it is timely to consider whether this balance is optimal and how the laboratories should be comparatively reviewed as part of the broad program.

Recommendation 5

- **We recommend that the office develop a process to globally optimize and comparatively review the balance of support for HEP research at Fermilab, the universities and the other laboratories in light of the evolving program.**

Conduct of Reviews

The committee had a lively discussion of the review process. It is clear that reviews of various types form a key part of OHEP's oversight of the program and it is therefore important to make sure the process is as effective and useful as possible. Review committees should be given sufficient time to use the "Lehman Review" approach of exploring issues in detail and not be forced to sit through a very large number of presentations without time for questions. Reviewers should be able to meet privately together in executive session. Closeouts should be meaningful and the closeout reports should be communicated back in a timely manner (1-2 months). There were also some concerns over the consultancy model used in laboratory reviews: whether it might limit the consultants' ability to fully engage with the process and filter out their technical expertise.

Recommendation 6

- **We recommend that the office understand and communicate appropriate best practices for reviews, as suggested above, and ensure they are followed.**
- **The office should consider whether the consultancy model is optimal.**

Issues Concerning the University Program

In its breakout session, the university subgroup met with P.K. Williams who summarized the university program in OHEP. Afterwards three hours were spent reading proposal jackets. Although we would have liked more time to read through the grant documentation, we found the proposal, award, and funding process for renewals and continuations to be sound and to support effectively national and OHEP goals in ongoing research and program development.

We were greatly impressed by the level of dedication and commitment of the staff in the university program. We found their workload to be daunting. The last COV highlighted the inadequate staffing level as a serious problem. Although new people have been brought on since the last COV, the level of staffing remains critically low. We encourage OHEP, with help from the HEP community, to aggressively recruit to fill the vacant position in the university program and to add at least one IPA. We view these staffing increases as crucial to the effective functioning of the university program office. Our recommendations concerning this have been noted above (**Recommendation 1**).

The Outstanding Junior Investigator (OJI) program continues to be very successful in launching the research careers of some of the most talented junior faculty. The OJI review process serves as the primary mechanism for evaluating new faculty for additions to existing grants. It also provides flexibility in funding young physicists not associated with a major research group. OJI grants are exceedingly competitive, with 68 applicants in the most recent cycle and only 6 awards granted.

Recommendation 7

- **The number of Outstanding Junior Investigator awards should be increased by devoting more funds to this program.**

A summary of personnel supported on each grant, provided by the PI, was a recommendation of the previous COV and is now provided by most groups. The uniformity of reporting is facilitated by a template provided by DoE. We commend the DoE for implementing this reporting requirement.

The last COV also highlighted the need to establish a database of the university grants and people supported on those grants. This need remains. It would be extremely useful for the effective management of the university program to be able to track funding and the numbers of faculty, students and post docs by task. The comparative funding data, which is available online, is valuable and should continue to be available and be updated annually. Our recommendation for this has also been noted above (**Recommendation 2**).

Page limits for proposals are extremely helpful in the review process—both by keeping the amount of reading for reviewers under control and by forcing authors to be succinct and disciplined. Following the recommendation of the last COV, the university program

staff have implemented guidelines for page limits and proposal format. This is a positive development, and we propose further strengthening of the policy.

Recommendation 8

- **New and renewal proposals should be limited to a maximum of 10 pages per senior investigator. Proposals not meeting page-length limits or lacking required information should be returned for revision before being sent out for review.**

The use of visiting panels of consultants for renewals of large grants has been a valuable enhancement to the review process and a source of useful feedback for research groups. Organization of these reviews has imposed an additional burden on university program staff. This additional load could be partially compensated by eliminating routine annual site visits by program officers in continuation years.

Recommendation 9

- **Outside visiting consultants should continue to be used for 3-year renewals of large grants. The office should consider eliminating site visits in continuation years unless some unusual circumstance warrants such a visit.**

Proposal reviews vary widely in style, evaluation criteria employed and degree of specificity of recommendations. When theory and experimental groups are together in the same grant, there were concerns that the theory component is sometimes under-reviewed.

Recommendation 10

- **OHEP should consider providing a template to reviewers to provide guidance and greater uniformity of reviews.**
- **The office should ensure there are sufficient reviewers for the theory component of multi-task grants.**

As we were reading through the grant jackets, we often found it difficult to locate important information in the documentation. It would be very helpful to have key information about each grant readily available.

Recommendation 11

- **Each proposal jacket should contain as the first page a brief summary sheet which shows a history of funding levels by task, current funding, and personnel supported by category. As the proposals are moved online, this summary sheet should also be online.**

Issues Concerning the Laboratory Program

Integrity and efficacy of processes

Procedures for annual lab reviews are thorough and professional. The closeout sessions could be more useful if there were an open general closeout and a candid executive closeout. Reports are typically late (as noted by previous CoV) and should be delivered within 1-2 months. Topical reviews with outside consultants are useful, and the consultant letters seen by this Committee were excellent. In many of the topical reviews, the consultants contribute their advice in letters to the OHEP directly and these contributions are then combined and summarized by OHEP staff. In many cases the original letters from the consultants are very well written with good technical input, and the DOE report to the Laboratory might be improved by making more of the essential content of the consultant letters available. Our recommendations concerning reviews are noted above (**Recommendation 6**).

The COV found the dedication, technical skills, and professional competence of the staff of the OHEP at a high level. Annual reviews of the programs and laboratories have been carried out in a detailed and thorough manner. The benefits of these reviews are highlighted by the many scientific successes of the accelerator physics, particle physics and particle-astrophysics areas of the HEP field. The scientists working in these areas are very appreciative of the professional management of the HEP programs at DOE.

The LHC detector construction project has been well managed and is a success. The transition to the research program has been smooth. The US portion of the LHC construction project in both the accelerator and detectors is very close to being done (~98%). These activities have been carried out in an efficient manner and with a fixed budget. The oversight of this program by the OHEP has been excellent.

In general, OHEP ably serves a vital role of communicating the needs of laboratories to the other governmental bodies, and the demands of the rest of the government to the laboratories.

The International Linear Collider

The International Linear Collider (ILC) is the highest priority next major accelerator project being pursued by the HEP community worldwide. In the US, the ILC R&D program received the highest future priority from the National Academies Report EPP2010 and from the HEPAP sub-panel P5. The OHEP responded to the unusually complex international nature of the ILC by creating a senior leadership position, dedicated to ILC activities, that reports directly to the AD. This position is now held by a prominent scientist, who together with the AD, has established the OHEP as a respected

partner with the Global Design Effort (GDE), the laboratories, and the major funding agencies around the world involved in moving the ILC forward. One way in which the functioning of this office might be improved would be for there to be a formal mechanism whereby the relative support of accelerator and detector R&D funding could be determined.

The OHEP, through the dedicated efforts of the AD, has taken a proactive role in establishing the US as a strong member of the international team leading the design of the ILC. The ILC progress has been substantial in the last two years. At a technical level, the worldwide HEP community of accelerator physicists and engineers are working well together. The effort has been enormous and successful. The GDE team, with members from Asia, Europe, and the Americas, has converged on a conceptual accelerator design and cost estimate and is now working on a full engineering design report (EDR) and beginning to direct a coordinated accelerator and detector globally distributed R&D program.

The ILC accelerator R&D funds are well managed by the GDE Director of the Americas Regional Team (ART) with strong support from OHEP. These investments place the US in a strong position to prepare a bid-to-host for the ILC. However, the US does lag Europe substantially in advanced detector R&D funding. Increased involvement in the detector R&D program would better position the US to take a leading role in ILC physics. At the present time the division of funds between accelerator R&D and detector R&D is determined by OHEP in an ad hoc way, and a better mechanism is needed for determining this split. Ideally an important decision of this type should be based on advice from the community,

Overall, the OHEP should be congratulated on the success achieved thus far with the ILC program and for implementing the advice received from the community through HEPAP and P5.

Recommendation 12

- **The Office should establish a formal advisory mechanism to best optimize the split between ILC accelerator and ILC detector R&D funds.**

Ramp down of current efforts at Fermilab and SLAC

The PEP-II B-Factory at SLAC and the Tevatron at FNAL will both be turned off in the next few years. This transition will be a large challenge for the field. There must be a clearly planned resource strategy developed and lead by the OHEP to evolve the laboratory and university programs to be successful. Each laboratory has core technical competencies which are unique and essential for the field's long term technical program. These competencies need to be identified and the ones preserved that are in the interest for the long range strategic management of the field. Which competencies are developed

and which ones let go should be carefully managed. These decisions need to be made soon to set priorities.

Recommendation 13

- **OHEP should work with the community and the laboratories to formulate a plan for stewardship of accelerator science in the US during the coming transition to a period without an energy frontier machine. This plan should recognize the centrality of maintaining and developing high energy accelerator science and technology in the US, and training the next generation. This goal can be accomplished through US-centered mid- and long-term research, through collaborative activities overseas and through participation in other Office of Science projects.**

The OHEP has for several years recognized the potential shortage of physicists needed to continue smooth and efficient operation of the CDF and D0 detectors at Fermilab, during the important high luminosity years, and the simultaneous need for physicists to aid in commissioning the LHC detectors. The OHEP, through HEPAP, conducted surveys and raised awareness of these issues to the community. In addition, the P5 sub-panel was charged with recommending the optimal shutdown dates of the SLAC and Fermilab collider programs so as to effectively utilize resources for the upcoming LHC program. This planning led to an optimization of resources and personnel needed to continue running the collider physics program. The OHEP is to be congratulated for establishing mechanisms to manage resources within the community to effectively carry out the program.

Once SLAC operations move to BES, OHEP will support experimental and theoretical groups at four former accelerator laboratories, ANL, BNL, LBNL and SLAC. Is it optimum that the activities of these groups continue to be evaluated separately from virtually identical activities taking place at universities? To be sure, the technical infrastructure available to experimental groups at these four sites is superior to that at universities, and the budgets of these four programs reflect that, but from a qualitative perspective, physicists at these four institutions are engaged in many of the same types of research activities, within the same international collaborations, as university faculty. Because of their superior technical infrastructure, in people as well as in facilities, the labs are able to carry out larger scale accelerator and detector R&D projects than most university groups, and university groups are generally much more involved in graduate education, but in general, the commonalities outweigh the differences among these groups.

By establishing a common review mechanism for universities and labs, a more coherent national “user program” can be developed and sustained in the new era that is dawning for US HEP. Maintaining distinct funding “silos” for university-sited user groups and those sited at former accelerator laboratories, has largely an historical, as opposed to a logical, explanation. It may be worth pointing out that many of the larger university groups had their origins in an era when these institutions also had their own dedicated

accelerator facilities. (Some committee members felt that Fermilab, as an active HEP accelerator laboratory, could continue to be reviewed by separate mechanisms, while others felt that it should also be reviewed in a common framework).

Our recommendation in this area has been noted above (**Recommendation 5**).

Issues concerning the Accelerator research program

High energy accelerators are the engines that have driven our understanding of particle physics. Particle physics has continually been able to explore new frontiers through developing and building new high energy accelerators reaching new energy regimes. Although exciting new areas, especially in particle astrophysics, have been and are pursued without accelerators, the central tool of the field continues to be accelerators and this will continue through the coming decades, first with the LHC and then a Linear Collider.

Given the central role of accelerators in the DOE HEP program, the work of the Advanced Technology R&D Group is critical to the future of high energy physics research. The Advanced Technology program has, and continues to have significant successes given the modest resources allocated to it. High Energy Physics continues to lead the way for all fields in developing accelerator concepts and this is a significant contribution to the overall science and technology program in the U.S. We believe that the quality of and the support for this program is extremely important to HEP and other fields.

In the past year, OHEP has explicitly embraced the stewardship of accelerator science in general as a component of its core mission. However, the US will soon no longer be host to an energy frontier machine. Without a concerted effort to maintain the capabilities of the national program in high energy accelerators, the US will lose the ability to meet future demands for designing, constructing and running energy frontier machines, like the ILC. A variety of activities will be required to address this problem. First, the existing US program on mid-term and long-term accelerator R&D should be extended, with particular emphasis on training the next generation of accelerator physicists and engineers. It is important to nurture existing programs at universities that are not directly associated with a particular large facility. OHEP should also encourage opportunities for US accelerator scientists to participate in accelerator development outside of the country, such as LARP. The current trend for HEP accelerator physicists to engage in development of advanced light sources or large nuclear physics projects, should also be encouraged, as the physics and technology issues are often synergistic.

Our recommendation in this area has been noted above (**Recommendation 13**).

Processes for proposal actions

The solicitation process for accelerator R & D proposals is done via the Federal Register. The procedure appears adequate for the universities, the smaller National Lab HEP programs and industry. There are no set deadlines for the receipt of proposals and this helps give the office flexibility in the review and award process. The previous COV recommended that the roster of reviewers be expanded to include more accelerator experts outside of the HEP field. This recommendation has been very satisfactorily implemented.

The previous COV recommended that there be an improvement in the proposal documentation process. We are delighted to note that the organization of documentation in support of the review and award process has improved significantly since 2004, both from the standpoint of hardcopy files and the availability of SBIR records in an easily accessible computer database.

One recommendation of the previous COV which has not yet been implemented is to add a summary sheet for each proposal showing briefly dates, actions taken, funding, resources, personnel, highlights, in order to provide a quick history without digging through the folders. In addition, basic information should be recorded in a database to allow better tracking, trend summaries, etc. For example, it would be useful to be able to obtain summaries of totals or averages of funding, duration, number of students, postdocs, and more. This is not possible as long as the key data is only stored in individual folders. We do not believe this database is yet available.

Our recommendation in this area has been noted above (**Recommendation 2**).

The Small Business Innovation Research (SBIR) Program review process is working very well. This is particularly noteworthy given the large number of proposals received, and the lack of funding for administrative help with the review, award and monitoring process. The OHEP Advanced Technology group has been very effective in organizing assistance from members of the HEP community in the SBIR process. The OHEP SBIR process is so well run that OHEP has been asked to help other areas of the Office of Science with their own SBIRs.

Recently, DOE OHEP and NSF created a HEPAP subpanel to review and advise on accelerator research in the US. This subpanel issued a number of recommendations, several of which have already been adopted by OHEP. Among them, we note that the OHEP has added the stewardship of accelerator science in its mission statement. The planned budgets for advanced accelerator research issued by OHEP follow appropriately the guidelines for funding increases as called for by the subpanel.

The subpanel also recommended that OHEP convene a review panel to set funding priorities across a range of mid-term and long-term accelerator research areas. A panel was convened earlier this year, and has given preliminary feedback to the agency. Among its recommendations, the panel requested an increase in the transparency concerning priorities, progress and resource allocation in mid-term accelerator R&D. Without such transparency, a meaningful comparative review of different components of the program would be difficult.

The oversight of mid-term accelerator research would be improved by anonymous peer-reviews modeled on those for the long-term R&D program. This peer review process has provided an independent evaluation on the quality and relevance of each proposal. Perhaps even more importantly, the reviews in a given funding cycle, taken as a whole, yield a picture of the relative value of each separate area of advanced accelerator

research. This would permit a critical comparison of the relative worth of the differing research areas within the program.

Recommendation 14

- **The peer-review process in accelerator research should be expanded to cover mid-term accelerator research to provide comparative evaluation of the merit of different research efforts.**

Processes for national labs

The Advanced Technology R&D Group plays a supporting role to the Facilities Operations Group in dealing with the accelerator facets of large National Laboratory programs. The program managers do include accelerator-specific breakout sessions during the HEP program reviews and we believe this enhances the quality of reviews. There has also been an effort to include more expert accelerator consultants on these program review committees, as recommended by the previous COV.

The management and oversight of the ILC R&D effort has greatly benefited from the attention of a dedicated OHEP IPA working closely with the Americas Regional Team (ART) leaders under the ILC Global Design Effort. Funding allocations are tailored to the project priorities and the capabilities of the contributing laboratories. Written progress reports are required at least semi-annually and there is an annual DOE review. For the last few years, there has been a separately administered program of ILC accelerator & detector R&D in the universities. This will be merged with the ART effort after 2007. While we agree that it is appropriate to terminate the separate program, the ART leaders working with DOE should continue to solicit university contributions to the ILC R&D wherever possible. Detector R&D must also be protected as it has no natural advocate in the ART structure.

Compared to the rigorous process in approving and reviewing the long-term advanced accelerator R&D program, the planning for the medium-term accelerator R&D program conducted at the national laboratories appears less rigorous and the selection process is less transparent. A peer-review process as outlined above could ensure a comparative review.

Quality of results

The Advanced Technology R&D program has produced numerous outstanding results including examples such as superconducting magnet R&D and the developments in superconducting materials that have enormously wide impact (beyond HEP), plasma devices for acceleration and manipulation of beams, fundamental beam theory and experiments and support for future facilities such as linear collider and neutrino factory R&D. Recent notable results include:

- monoenergetic laser acceleration of an electron beam to 1 GeV by the L'OASIS group at LBL,
- doubling the energy of the SLAC beam by the plasma wakefield acceleration by the SLAC/UCLA/USC E-167 collaboration. The gradient achieved (about 42 GeV/m) is a factor of 20 to 50 higher than those provided by traditional acceleration mechanism provided by copper structures.

Support for basic accelerator science is both unique and outstanding. Many important areas would likely be without support, if it were not for the pro-active approach of the Advanced Technology R&D Group. The University program supported by the Group has been a major source of PhDs having a broad array of cross-disciplinary skills. The SBIR funds represent a significant fraction of program funds and the group's efforts to keep SBIR aligned with overall program goals are commendable

Relationship to program goals

The strategic plan and strategic principles presented by OHEP are in alignment with the 2006 P5 and HEPAP sub-panel recommendations and are suitable for guiding OHEP-specific advanced accelerator R&D in the medium-term and accelerator science and technology in the long-term. The goals for the medium-term accelerator R&D plan include the US support of performance improvements of the LHC, US support of the ILC Global Design Effort and activities directed at developing a credible case for the US hosting the ILC, and the development of Superconducting RF capabilities and infrastructures in the US. The strategic principles for long-term advanced accelerator R&D focus on the research programs capable of extending the reach of accelerator-based physics, new acceleration concepts and education of accelerator physicists and engineers. The long-term strategic principles also emphasize OHEP's stewardship of accelerator science and technology.

Issues concerning the Management of Large Projects

The Facilities Division and members of the Research and Technology Division are essential to establish and monitor equipment fabrication and construction projects. The acting head of the Facilities Division, Dr. Michael Procario, presented an overview of the activities of the OHEP to select, initiate, review and monitor major HEP projects. Documentation from recent reviews of major projects was provided to the COV. In addition, Dr. Procario and other members of the OHEP provided material on future planning and interagency/international interactions to the COV and answered numerous questions. The COV appreciates the open and very responsive discussions regarding oversight of major projects.

The OHEP provides project management oversight for a large variety of projects. This includes accelerator and detector projects located at Laboratories in the US, accelerator and detector projects at non-US laboratories (e.g. ATLAS, CMS and the LHC) and non-accelerator projects inside and outside the US. The last category includes cosmology/particle astrophysics projects. The integrity of the OHEP process to provide project management oversight is excellent.

The OHEP relies heavily on the advice from advisory committees (HEPAP, P5, Scientific Assessment Groups – SAGs, etc) as well as from Laboratory mechanisms for proposals and review. The interaction between the OHEP and these advisory bodies has led, in general, to support closely tied to the priorities established for the field. However, there will be significant changes in the field in the next 2-3 years. The PEP-II/BaBar effort at SLAC and the Tevatron program at Fermilab will be phased out. The LHC will turn on and there will be a significant investment in ILC R&D. Exciting new opportunities in neutrino physics, dark matter searches and dark energy studies are on the horizon in the same time period.

Recommendation 15

- **The project initiation and management process in the OHEP should continue to be closely aligned with the HEPAP/P5 prioritization process for HEP and the strategic goals of the Office of Science. Interactions with the appropriate advisory bodies should increase in frequency. The detailed budget and schedule planning for major projects needs to be more proactive, particularly at this critical juncture for high energy physics.**

A significant number of projects (e.g. Numi/MINOS, CDMS, LHC accelerator, etc) have been completed successfully in the last three years. The project management oversight within the OHEP has been instrumental in the successful completion of these projects. The monitoring processes for projects in the execution phase are very effective. Experience with recent projects shows that the execution phase has been carried out according to project plan, on time and within budget. In addition, OHEP has been

effective in its application of DOE Order 413.3a for projects under \$20M, tailoring the requirements of the order to meet the needs of these projects.

However, some recent efforts have been terminated (e.g. BTeV) early in the project life-cycle but still after a significant investment of resources and effort were made. The decision process within the OHEP in the cases of early project termination is perceived to be less transparent than is desirable.

Recommendation 16

- **To the greatest extent possible, only those major projects for which the physics goals are well matched to the priorities in the field, and whose overall scope, cost estimate and funding requirements are consistent with each other should be advanced to construction status. In this regard, establishing a funding cap prior to establishing a realistic baseline should be avoided because it introduces risk that a project can not be completed within budget or that its scientific scope will not be delivered.**

The OHEP supports major projects that involve other U.S. agencies and international partners. Current projects with multi-agency support include LHC, GLAST, Daya Bay, and others. Potential future projects include the land and space based dark energy experiments, ILC and LHC upgrades, among others. The most common partners in the U.S. are NSF and NASA while the international partners are more diverse. The trend toward increased partnering and joint support is expected to continue. For the future, more than half of projects listed on the OHEP Project Summary Information worksheet provided at the review fall into this category.

Multi-agency sponsorship of projects presents a number of challenges and opportunities. At the project initiation stage, staff from the participating agencies must work together to determine the need for the project, define the scope and deliverables, establish the cost and schedule baseline, and agree upon a joint funding plan. The implementation phase typically requires that agency staff continue to interact to resolve a myriad of issues. Many issues derive from the different practices within the respective agencies. OHEP is accumulating considerable experience with multi-agency partnerships and are now able to anticipate the types of issues likely to be encountered in the future. The program managers for individual, ongoing projects are working effectively with other US agencies and multi-national funding bodies. It is recognized that future program success is now closely tied to making these multi-agency relationships effective. This involves effort at all levels of the organization. The scale and importance of the effort suggest that a higher level of effort and visibility within OHEP is required to carry-out multi-agency sponsored projects in the future.

Recommendation 17

- **The office should continue to pursue opportunities to support projects in collaboration with other agencies, both domestic and international. The Office should recruit an individual (or an IPA position) to be proactive in coordinating and facilitating these efforts, including international agreements, at a high level within the OHEP.**

The OHEP works closely with the SC Office of Project Assessment (OPA - headed by Dan Lehman) to review major projects. This arrangement is effective and working well. Documentation from project reviews organized by OHEP with OPA is extensive and thorough. The partnership between the OHEP and OPA is well recognized to be an efficient means to provide high-quality oversight. The OHEP assigns a program manager to each major project. The responsibilities of these program managers are well defined. And the OHEP program managers have become familiar with the oversight processes at other agencies (NSF and NASA) that are essential for the current multi-agency-supported projects. The program managers currently provide oversight for about seven major efforts. And the same program managers also provide oversight for some Laboratory and research operations outside these projects. Additional projects are anticipated to require program management in the next 2-3 years. The bottom line is that staffing levels in the OHEP need to increase to maintain the high quality oversight needed to initiate and oversee major projects.

Recommendation 18

- **The office should add staff to the Facilities Division to provide sufficient project management oversight for upcoming major projects.**

Appendix A – Membership of the Committee

CHAIR

John Womersley, Science and Technology Facilities Council, Swindon SN2 1SZ , UK

ACCELERATOR GROUP

Nan Phinney *, Stanford Linear Accelerator Center

Patrick O'Shea, University of Maryland

Jamie Rosenzweig, University of California at Los Angeles

Dave McGinnis, Fermi National Accelerator Laboratory

LABORATORIES GROUP

Jim Alexander *, Cornell University

Paul Slattery, University of Rochester

Nigel Lockyer, TRIUMF

John Seeman, Stanford Linear Accelerator Center

UNIVERSITIES GROUP

Marjorie Corcoran *, Rice University

George Sterman, State University of New York at Stonybrook

Ian Shipsey, Purdue University

Ron Poling, University of Minnesota

PROJECTS GROUP

Murdock Gilchriese *, Lawrence Berkeley National Laboratory

Ken Stanfield, Fermi National Accelerator Laboratory (Retired)

Satoshi Ozaki, Brookhaven National Laboratory

Jim Yeck, Brookhaven National Laboratory

* team leaders

Appendix B – Agenda for the Review

Monday, June 18	
8:00 AM	Continental Breakfast (<i>E-301</i>)
8:30 AM	Welcome, Charge to Committee, COV Guidelines Robin Staffin, Associate Director, Office of High Energy Physics (HEP)
9:00 AM	HEP Overview — Robin Staffin Budget Process Overview — Glen Crawford
9:45 AM	Executive Session (Committee and Robin Staffin only)
10:15 AM	<p>Review of Individual HEP Activities (Move to Breakout Rooms)</p> <ul style="list-style-type: none"> • Laboratory facilities and research (joint overview for this item and project management by Mike Procario) (<i>G-426</i>) • Project management (<i>G-426 for overview and then G-207</i>) • University research (overview by P.K. Williams) (<i>G-436</i>) • Accelerator R&D (overview by LK Len) (<i>J-108</i>) <ol style="list-style-type: none"> 1. The integrity and efficacy of processes used to solicit, review, recommend, and document proposal actions; 2. The integrity and efficacy of processes used to review, recommend, authorize, and document funding actions under the Management and Operations contracts in place at the DOE national laboratories; 3. The quality and significance of the results of the Office's programmatic investments; 4. The relationship between award decisions, program goals, and SC-wide programs and strategic goals;
12:30 PM	Working Lunch (set up in H-412)
1:30 PM	Review of Individual HEP Activities (continued in Breakout Rooms)
4:00 PM	Preparation of Individual Program COV Reports
7:00 PM	Adjourn

Tuesday, June 19 (Room E-301)	
8:00 AM	Continental Breakfast
8:30 AM	Executive Session
9:00 AM	Distribution of Individual Program COV Reports and Presentation of COV Reports by Program COV Chairs
10:30 AM	<p>Office Level Review</p> <ul style="list-style-type: none"> • The Office's research investment, balance, and priorities; • The organization and effectiveness of the HEP operation (The HEP organization has been “stable” for a long time while the field, both domestic and international, has changed dramatically. Has the HEP organization adapted or is a reorganization of HEP in order?); • Any other issues that the COV feels are relevant to the review.
12:00 PM	Working Lunch
1:30 PM	Preparation of Office-Level Report (<i>breakout rooms available if needed</i>)
5:00 PM	Closeout Session with Robin Staffin and Office of High Energy Physics staff
5:30 PM	Executive Session (Committee and Robin Staffin only)
6:00 PM	Adjourn

Appendix C – Charge to the Committee



Department of Energy
Office of Science
Washington, DC 20585

April 11, 2007

Professor John Womersley
Director, Science Strategy
Science and Technology Facilities Council
Polaris House, Swindon SN2 1SZ, UK

Dear Dr. Womersley:

Thank you for agreeing to chair the 2007 Committee of Visitors (COV) for the Office of High Energy Physics (OHEP). The COV Review will take place at the Department of Energy (DOE) Facility in Germantown, Maryland, on June 18-19, 2007. This COV will follow on the work of the original COV formed in 2004 as an *ad hoc* subcommittee of the High Energy Physics Advisory Panel (HEPAP).

DOE is looking to the COV to assess its program management, to provide advice to improve OHEP performance, and to ensure openness to the research and education community served by the DOE. Reports generated by this COV will be used in assessing agency progress in order to meet government-wide performance reporting requirements, and will be made available to the public. The COV is charged to address and prepare a report on:

- the integrity and efficacy of processes used to solicit, review, recommend, and document grant proposal actions;
- the integrity and efficacy of processes used to review, recommend, authorize, and document funding actions under the Management and Operations contracts in place at the DOE national laboratories;
- the overall quality and significance of the results of the Office's program-wide investments;
- the relationship between award decisions, program goals, and Office of Science-wide programs and strategic goals;
- the Office's research investment, balance, and priorities;
- the organization, effectiveness, and adaptability of the OHEP operation to the evolving research environment.
- any other issues that the COV feels are relevant to the review.

Decisions to award or decline proposals are ultimately made by OHEP staff whose informed judgment is based on evaluations by qualified reviewers who reflect the breadth and diversity of the proposed activities and the community. Systematic examination by the COV of a wide range of OHEP's funding decisions provides an independent mechanism for monitoring and evaluating the overall quality of the Office's decisions on proposals, program management and processes, and results.



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The review will assess operations of individual activities in OHEP as well as the Office as a whole for three fiscal years: FY 2004, FY 2005, and FY 2006. The activities under review include:

- Laboratory facilities and research
- University research
- Accelerator R&D
- Project management

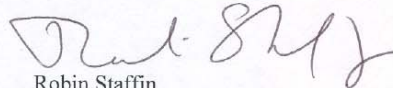
The general outline of the meeting will be an introductory session in which I will present an overview of the Office's activities, programs, and plans. Following this session, the COV will break into subgroups, and at these individual meetings, an appropriate OHEP staff member will provide a more in-depth discussion of the particular group activity as well as a review of statistical information and procedures. The subgroups will then examine program documentation and results and prepare program-level review reports. The following day, there will be a review of the Office as a whole and preparation of an Office-level report, based on the program-level reports and other material as appropriate.

Drafts of the program-level reports and the Office-level report will be completed during the COV meeting. I ask that you finalize and submit the full report by July 1, 2007, to allow time for a status report to HEPAP prior to their meeting on July 13-14.

The agenda for the review will be made available to you in the near future. Also, to assist the committee, we have established a private web site (<http://www.hep.net/COV/>) on which we will be posting background information for your perusal prior to the review. The password for this site will be provided to you and the other members by an email from Marsha Marsden. The material posted to this website and other information will be available for the Committee's use at the Review. Please feel free to contact me at (301) 903-3624, robin.staffin@science.doe.gov or Katie Perine of my staff if you have questions about the review. You can reach Katie at (301) 903-3624 or Katie.perine@science.doe.gov.

Thank you again for your willingness to participate in this important activity. I look forward to seeing you at the meeting.

Sincerely,



Robin Staffin
Associate Director
Office of High Energy Physics

Enclosures:
List of Members of the FY 2007 HEP COV

cc: Mel Shochet, Chair HEPAP